

Developing High Fidelity Android Games

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High Fidelity Gaming Experience

✓ High Quality Graphics

✓ Immersive Gameplay

✓ Ultra High Performance

Frame Rate Stability

You have unspent ability points

OpenGL ES

You have unspent ability points

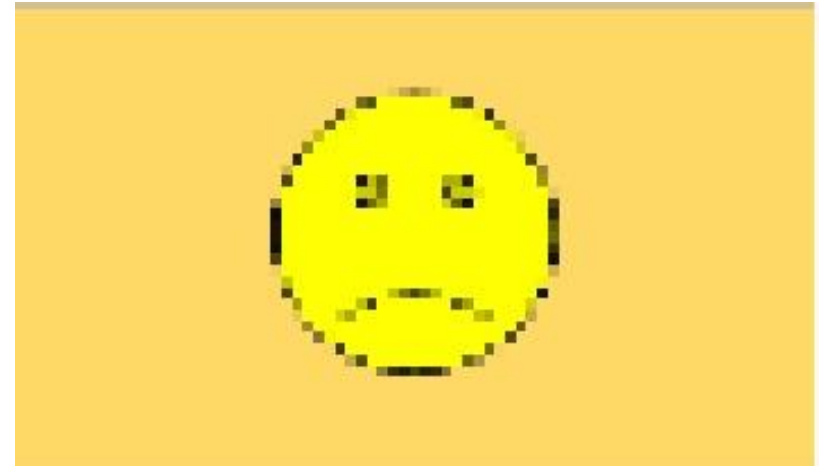
Frame Rate Stability

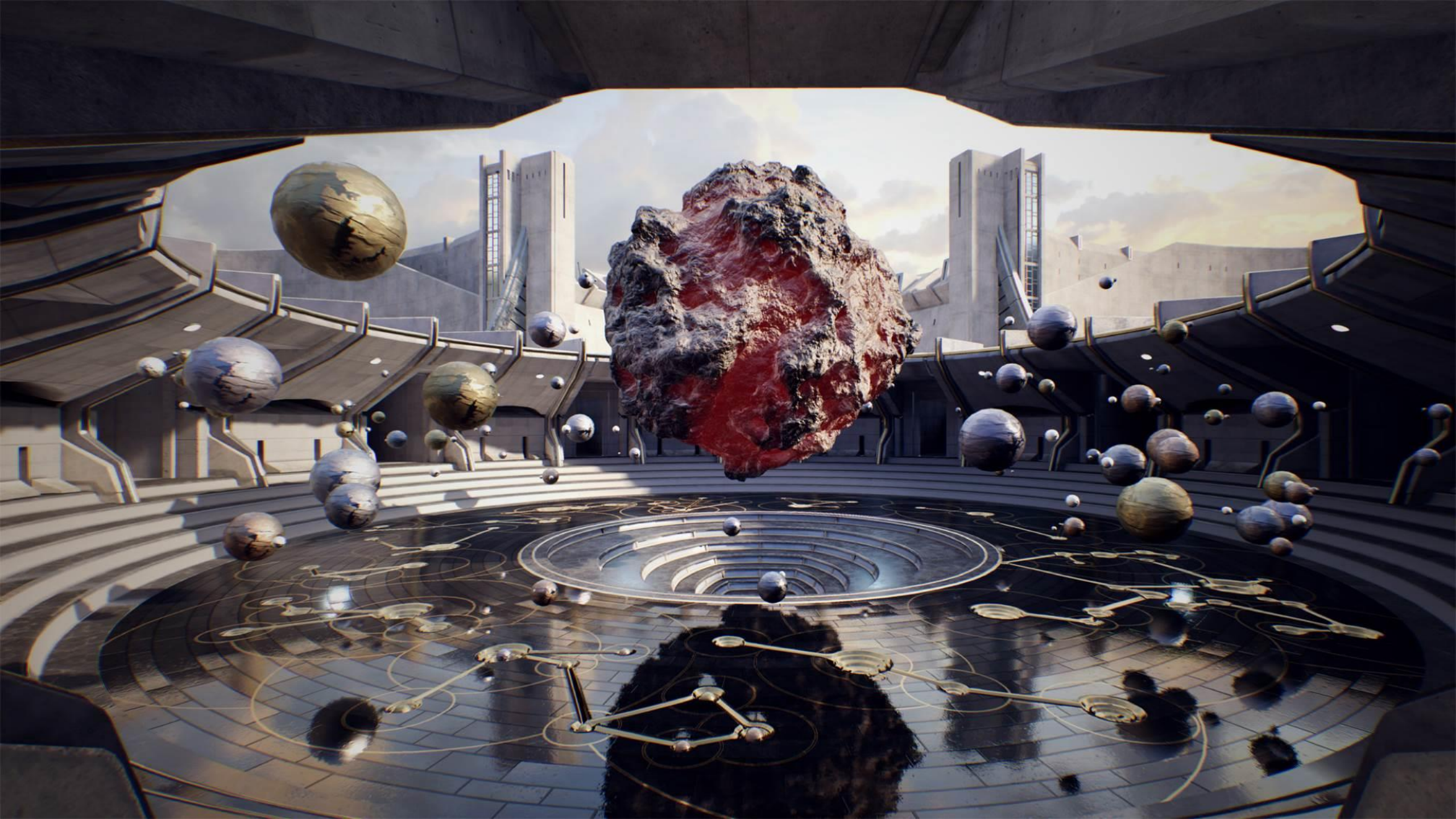
Vulkan

Traditional Optimization

Trade-off between quality and performance

- **Smaller** target resolution
- **Lower** target frame per second
- **Less** shader complexity and precision
- **Reducing** workload of CPU and GPU





Advanced Optimization

Trade-off between quality and performance

- **Larger** target resolution
- **Higher** target frame per second
- **More** shader complexity and precision
- **Maximizing** workload of CPU and GPU



Advanced Optimization

Vulkan is whole new Technology

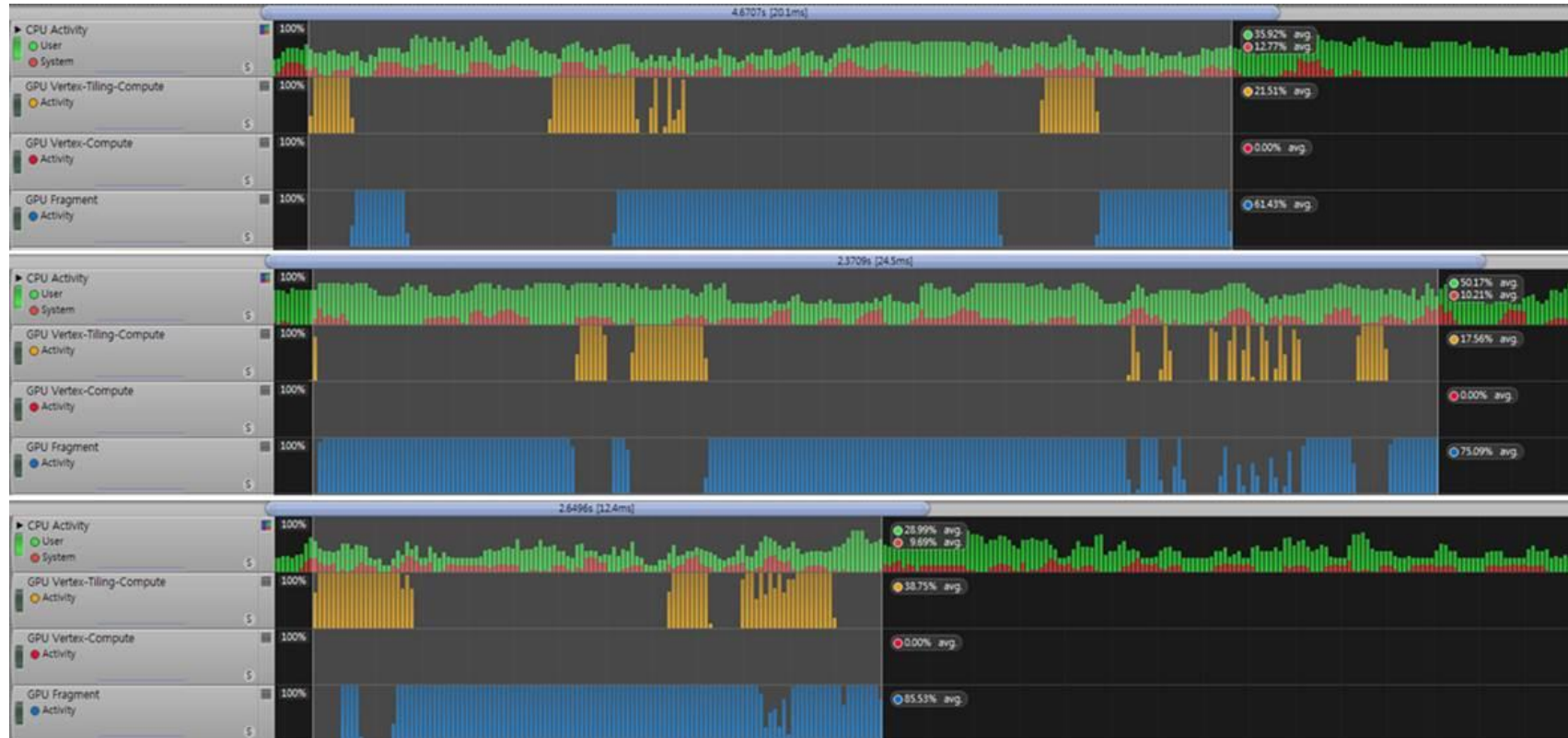
- Cross Platform
- Ultra light weight
- Predictable / Explicit Control
- Bunch of great tools to optimize games



Advanced Optimization

Vulkan gives real benefit : Work offloading + Improving efficiency

- OpenGL ES
- Vulkan (X)
- Vulkan (O)



More Vulkan Devices

Now, various Galaxy Devices support Vulkan

Galaxy S6

Galaxy S6 Edge

Galaxy S7

Galaxy S7 Plus

Galaxy S8

Galaxy S8 Plus

Galaxy Note5

Galaxy Note FE

Galaxy Note8

Galaxy Tab S3

Galaxy A5 2017

Galaxy A7 2017

More Vulkan Devices

Vulkan will bless mass / mainstream devices even more

Frame per Second	 OpenGL ES.	 Vulkan.	Gain
Galaxy S7	52	55	5%
Galaxy A5	42	48	13%



Game Engine Support



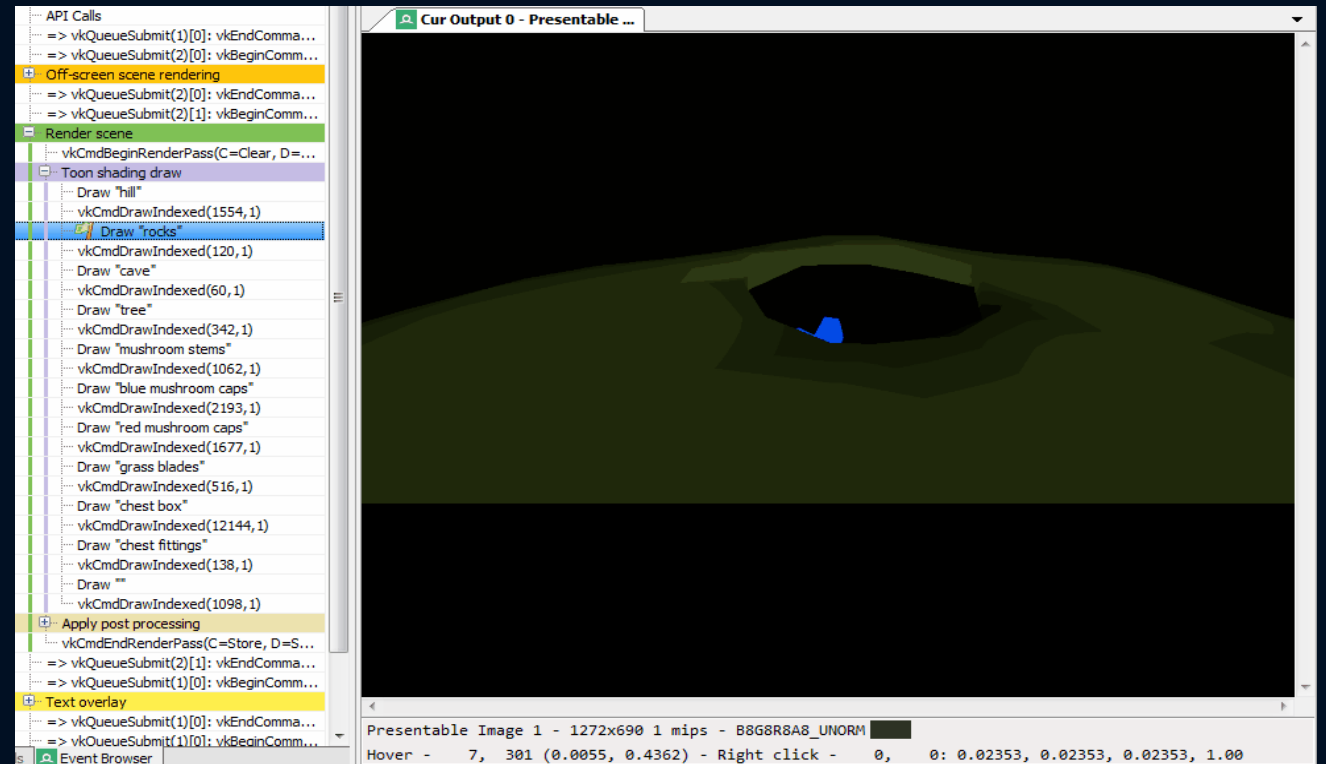
SAMSUNG
Galaxy

Protostar



RenderDoc

- Samsung contributed RenderDoc for Android platform
- Both Vulkan and GLES are ready to support




Adoption of New Technology

Samsung is supporting mobile gaming ecosystem to bring it in!



High Fidelity Android Games

SAMSUNG Galaxy +  **Google Play**

Google I/O 2017

Lineage2: Revolution

Under collaboration with Samsung we did Vulkan integration of Lineage2 : revolution for achieving both graphical innovation and especially big improvement in performance.

This was also the essential solution for bringing massive scale castle siege battle as the biggest new feature to extend game's lifespan and we finally made successful update right on time by great effort from Samsung team.

-Duke Donghyun Kim (Director, Netmarble)



AxE (Alliance x Empire)

“ Samsung Electronics has been a great partner for developing a fully mobile-optimized game engine based on the Vulkan API. There was a performance improvement of 20% over the legacy game engine which uses OpenGL ES. ”

-Kihoon Shim(Director, Nexon)

AxE

ALLIANCE X EMPIRE

 NEXON NEXON RED

ArcheAge BEGINS



"We feel very lucky to have received such a wonderful support from Samsung while applying Vulkan to ArcheAge Begins."

Technical cooperation with Samsung, along with its excellent engineers, was a delightful experience and a necessity to bring the 'better and faster' feel to the gameplay."



ArcheAge
BEGINS

- XL Games, ArcheAge: Begins Team



Hundred Soul

Mobile Action-RPG

MOBILE ACTION-RPG

Coming soon in the first quarter of
2018

Hundred Soul



Hundred Soul



Hundred Soul

Performance Comparison - Galaxy S8

	FPS	FPS Stability	CPU Usage	RAM Usage
Mali_GL	35	71%	14%	417M
Mali_GL (Optimization)	43	78%	13%	432M
Mali_VK	46	87%	12%	447M
Mali_VK (Optimization)	48	87%	11%	445M



Vulkan Support Camp

SAMSUNG
Galaxy



SQUARE ENIX®

Vulkan Support Camp



Vulkan Support Camp

Vulkan Enabling and Additional Optimization

- Profiling & optimization of GPU overhead
- Profiling & optimization of CPU overhead
- Optimization of Post Processing Stack
- Unity Editor bug fixes
- Optimization while actually editing the product
- Work reduction of drawing load through coordination with artists of game studio

} Vulkan

} Others

FINAL FANTASY XV

POCKET EDITION



Optimized for mobile gameplay

Endearing visuals backed up by a more casual gameplay style

Same story-line as FINAL FANTASY XV

Game billing per 10 Episodes

To be released on Android / iOS / Windows10 in Autumn 2017

SAMSUNG

Partners



New Performance Tool

GPUWatch :

Performance Analysis tool in your Galaxy

- **Easy to use**

Enable in the “Developer Options”

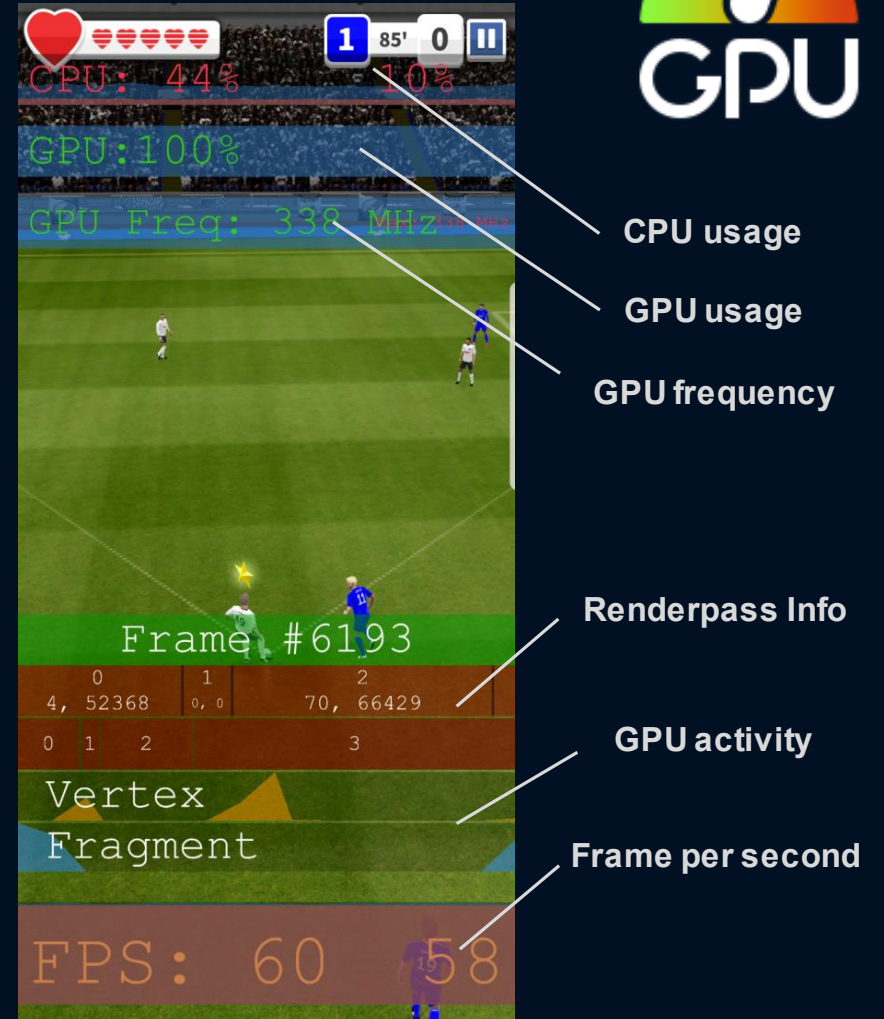
- **Just enough for the first look**

Single tool can cover S/W and H/W

Independent with vendor differences

- **Good bridge to the deeper dive**

Hints to move over to the pro tools



CPU usage

GPU usage

GPU frequency

Renderpass Info

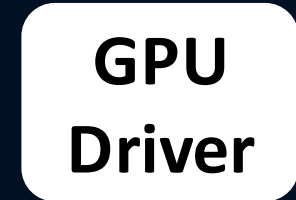
GPU activity

Frame per second

New Platform Features

Installable GPU Driver Update :

To manage GPU driver quality with more better way Samsung and Google closely work together for updating GPU driver with installable package from the store



Update

Galaxy GameSDK :

New interface to exchange power and thermal hint between game app and the device to manage gaming performance based on clear context is coming soon



Questions?

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